EXERCISES on the PARALLEL-BARS.

No. VI.

Exercises on the Parallel Bars from a Medical Point of View.

An Opinion by the Royal Prussian Deputation of the Medical Department, Berlin, Prussia.

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VI.

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FROM A MEDICAL POINT OF VIEW.

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Exercises on the parallel bars have been excluded from the Royal Central Institute of this place for some time, because in the opinion of the present director of instruction (Major Rothstein) they are not only unnecessary, but dangerous and injurious to the health of the pupils. The question of the admissibility of exercising on the bars has become an object of general controversy, carried on with considerable prejudice. The final settlement of this must depend upon the decision of the question whether the exercises on the bars, from a medical point of view, are justified, or whether they are to be condemned, and therefore his Excellency, the Minister of Education, has appointed this commission with instructions to give a full opinion. According to our instructions we are not to pass upon the objections raised from a pedagogical point of view, but we are only to investigate the question whether the exercises are injurious to the health of the pupils.

If we look at this question from an entirely general aspect, there is no doubt that the exercises on the bars, as well as all gymnastic exer-

After Major Rothstein, a scholar of Ling, had taken his position as director of the Royal Central Institute, of Berlin, one of his first acts was the abolition of the parallel bars, on the ground that they were productive of much harm. In this he was supported by a number of his followers, who, in the press and by pamphlets, charged all gymnastic apparatus, and especially the parallel bars, to be the cause of dislocations, ruptures, etc., etc. To investigate these charges and give a report, the Minister of Education of Prussia appointed a commission composed of eight of the most eminent physicians and professors. This report is herewith given and will be of as great interest now as formerly.

cises on apparatus, are, under certain conditions, unquestionably liable to be dangerous. We have no statistics of the more or less serious injuries received in the gymnasium during the last fifty years, giving us the number of cases by accident, awkwardness, or carelessness. If we had these figures the exercises on the parallel bars would undoubtedly show the smallest per cent., on account of the short distance of the bars from the ground, which would certainly exclude a great many dangers more generally connected with the higher apparatus. But we can indeed not speak of this class of dangers here, for if we should wish to avoid these, all gymnastics would have to be abolished.

Indeed, the objections to the admissibility of the parallel bars do not lie in this direction. In one of the pamphlets laid before us the author emphatically says, in reference to the disadvantages and pernicious effects claimed against exercising on the parallel bars, such as spraining, wrenching and tearing of the muscles, hemorrhages of the lungs, and affections of the heart, that even these have not appeared during the exercising, but have been mostly the result of imprudence and excessive practice. On the other hand, the much more weighty argument is offered, that, on account of the construction and peculiar mechanism of the parallel bars, the exercises to be made on them do not only give direct cause to the above-named casualties, but are to be regarded as a distant important casualty of future disturbances of the health, which often appear, in their after-effects, as lingering diseases in a definite form, months and years afterward, while the first, seemingly not important cause, is forgotten. Some have even tried to draw a parallel between exercises on the bars and "phosphorous poisoning."

It does seem as if the confirmation or refutation of this accusation should also be referred to the practical experience received from the use of the "parallel bars" in the gymnasiums, for more than a generation. The opponents of the "parallel bars" especially emphasize that the so-called "practical experience" furnishes no proof in this controversy, but that the theoretical criticism of the nature of those specific exercises, for which the parallel bars are designed, is alone permissible. We shall also in our task of the etiological investigation of this question try to determine the effects of the exercises on the parallel bars on the health of the gymnast from a purely objective point of view.

In the first place we must observe that the parallel bars are not to be regarded as a favored and preferred apparatus, but that they are to be used at a specified time in a systematic course of instruction. We also condition that the parallel bars must be so constructed as to suit the size and form of the gymnast. The two rails measuring about three inches in diameter, planed round and smooth on all sides, must be very little above the shoulders of the gymnast. For beginners, they should have about the height of the arm-pits, for pupils having more practice, they may be as high as the shoulders, or even the top of the head. Where a society of gymnasts of different ages practice, it is necessary to have a number of adjustable sets, which is true of many apparatuses. As a modification of a few inches does not matter, and it is therefore by no means necessary to have "a forest of parallel bars" in the gymnasium, this condition does not justify us in condemning

the " parallel bars " from a medical point of view. We shall not take into account the abuse of this apparatus.

It is impossible to understand properly the nature and importance of the exercises on the "parallel bars," if examined critically without looking upon them as a link in the carefully forged chain of a system of gymnastic exercises. We might as easily be led to false conclusions as we often are when a single sentence is taken arbitrarily from a book and subjected to our criticism. Only in this manner has it been possible that many have come to the conclusion that these exercises are unnatural; yes, contrary to the laws of nature, "because the arms instead of the legs are used to carry the body." But if we compare these exercises in this respect with others, we find an approach to this even in the use of the vaulting pole, identical in its nature in all swinging, climbing, and stemming exercises on the horizontal pole, the climbing apparatus, and the transverse bar. Hence we should be compelled to declare all these exercises as unnatural, if we accept the view "that only the lower extremities are the natural bearers and means of locomotion of the body, and that the upper are intended to perform actions and motions of an entirely different character." That man has not been created "to run on all fours or to walk on his hands with his feet in the air" goes without question. If he has been created to walk upright with his legs on the ground, it is certainly also his prerogative to thank his Creator that his limbs and joints are so wonderfully constructed that he can make use of them in many ways, thereby often saving himself from inevitable danger. Furthermore he can thus accomplish many feats and purposes, which would be impossible, if he did not understand how to use his hands and arms in place of his legs.

The body can only attain to this ability of performing such extraordinary feats by much practice. To give the body the necessary and varied practice is the material aim of all gymnastics. One also thus attains to the systematic development of his body by increasing the power and elasticity of his muscles, the strengthening of his nervous system, a better circulation of the blood, a skillfulness and self-confidence in all actions, a keenness of the senses, and a close concentration of the mind —advantages which gymnastics also claims as belonging to its formal purposes. As means to the attainment of this, gymnasts have used different apparatuses since the founding of the system. Some of these have been conceived with the idea of presenting to the gymnast circumstances which occur in his daily life, where he is called upon to place his body in unusual positions, to move the same from the smallest point of support in all directions, and, in fact, to perform suitable movements under difficult conditions. The dexterity thus gained therefore finds a practical application in many conditions of life.

If, in this regard, we have reference to the apparatus used for climbing and clambering, and the vaulting pole, we need not remind you that the same cannot be used with profit without special and thorough previous exercise of those groups of muscles which are specially needed therein. He who wants to climb and clamber, must be able to draw up the weight of his body entirely or partly from a hanging position by the strength of his muscles. But no one can attain

the ability of swinging his body over a higher object, without previously strengthening his arms through a systematic practice in stemming and supporting his whole body with both hands, thereby acquiring the power of keeping his body suspended for some time by his hands.

For these exercises the horizontal bar has been provided from which to suspend the body by the hands, the elbows, or the joints of the knees. Gradually a whole series has been developed, consisting of new, to some extent, independent movements, not only with stretched but also with bent arms. But on the horizontal bar, as well as on the transverse bar, only those exercises can be done wherein the shoulders lie parallel to the supporting bar. As this support is rather cramping and confining, partly on account of the position of the arms, partly on account of the pressing of the thighs against the pole, it was certainly a happy thought to invent a double bar, so that the body, instead of finding a support by means of the hands on one bar, found a more unconstrained position between two bars, one hand resting on each. This invention will seem quite simple to all those who remember that in their youth the backs of two chairs were often used as a support of the hands in jumping over the seats of the chairs, and these exercises found a general use as a kind of house gymnastics. With the introduction of the parallel bars, the horizontal bar was used mainly for the hanging exercises, while the supporting and stemming exercises were practiced on the parallel bars, so that now the two apparatuses are used as a complement to each other. There is another peculiarity about these exercises. As soon as the gymnast has attained the ability of holding his body freely suspended for a short time in one position of support, he will observe that the body can easily be given a swinging motion similar to that of the pendulum, and later he will, under proper instructions, find, as the muscles of the shoulders and arms, assisted by the muscles of the trunk and hip, increase in strength, that he will be able to pass from these mechanical swinging movements to independent, systematic swinging exercises of the body.

As the mechanical swinging of the freely suspended body on a suitable support will certainly increase the force which must be employed in the proposed leap, these exercises prove to be the best preparatory exercises for the use of the vaulting pole, *i. e.*, for vaulting, leaping, or jumping. In a properly arranged system of gymnastics these exercises, especially swinging, vaulting, turning and side-leaping, balancing, etc., must precede the analogous exercises on the vaulting pole, on account of the support being only on one side and the body not hanging freely suspended.

Having presented the most important of the specific exercises on the parallel bars, and having determined the place which they should occupy in gymnatics, we shall now take up the investigation of their effects on the health of the gymnast.

That all exercises of support and stemming are intended to increase the strength of the muscles of the arms, will certainly not be questioned by anyone; therefore it will be granted that this purpose is attained by the parallel bars. To this concession we beg to add, that

the support on the parallel bars particularly tends to the strengthening of the groups of muscles, as the normal relative position of the stretched arms to the shoulders and to the trunk is retained to a greater degree than on an apparatus with only one rail. On the other hand, the assertion is made that he who wishes to gain this, will not only be forced to an excessive exertion of his strength, but is also in danger of sacrificing his health. We have before us figures and computations which are to show us clearly the anatomical and mechanical conditions, under which the support takes place, and which by giving us exact data of the amount of strength required to bear the weight of the body on the extended arms, thus present to us forcibly the injurious effects of these exercises on that particular part of the bodily frame. Although we do not claim that calculations of this kind are of no theoretical value, presuming that they are based upon correct principles, still we cannot look upon them as furnishing correct conclusions of practical value. Besides the obvious, mechanical factors, there are also other considerations of moment to be taken into account, which cannot be used in the mathematical formula.

We find that these very vital co-efficients have been fully considered, and due attention has been given to them in the exercises on the parallel bars, while in the above calculations no account whatever has been taken of them. The rule followed in all gymnasiums, that no one is permitted to exercise on the parallel bars who cannot leap into the proper position, shows that due regard is given to the condition of the body and strength of the pupil.

The weaker boy who tries to leap into his position and cannot stay there, comes at once back to his first position without any exertion. He will perhaps try this jump many a time in vain, till he gradually through these attempts has gained the necessary strength of the muscles of his arms to balance his body above the points of support. If the teacher even then perceives any trembling of the arms, it is his duty at once to stop the exercising for that lesson. In this manner the young beginner will learn to remain in his proper position of support in the same, perhaps even in less, time than he who begins on the parallel bars in more mature years. When one has attained to this point he feels no strain whatever, till the yielding strength in the nerves causes the tense muscles to relax, and the body sinks without danger back to the ground. It is the duty of the teacher to supervise the efforts of his pupils. We therefore cannot find that excessive exertion is a requisite of the exercises on the parallel bars.

If we picture to ourselves the gymnast hanging on the parallel bars as a mere bundle of bones and bands (as we find him represented in these typical figures), we could easily come to fear that the ligamental connections of his collar-bone, shoulder-blade, and upper arm must be stretched to the utmost limit of their extensibility. But this is not so in reality. The bones of the frame of the shoulders which are attached to the skeleton by the collar-bone, are borne, sustained, and regulated in their motions by powerful muscles so strong that if an external force is applied, the bones will break before these, seemingly insignificant, sinew connections are altered in their structure. Each exertion of the

arms, which in a vertical position, shoves the shoulder-bones, by means of the proper muscles, toward the spine, while in front by means of the muscles attached to the throat and chest, the collar-bones, through an opposite action, are drawn closer to the first rib on each side and held there securely. These combined actions of the muscles cause the chest to rise and become more arched. The weight of the balanced body also causes an enlargement of the chest towards the sides, which can only be beneficial to the process of respiration. It is impossible that the tension of the walls of the chest during the support should produce a stoppage of the breathing, as the diaphragm, which mainly performs the act of inhalation, is in no way hindered or constrained, while the muscles of the abdomen, that are the most effective in exhaling, are assisted in their action by the increased tension. Do we not know that persons affected with asthma are greatly relieved by stemming their arms and shoving back the shoulder-blades?

Accordingly there is also no reason to look for any stoppage of the free circulation of the blood and its disastrous consequences. There is no doubt whatever that the more the lungs are expanded, the more freely the circulation of the blood must go on.

The effects discussed above, viz., strengthening of the muscles of the frame of the shoulders, expansion of the chest, promotion of the act of respiration, and the circulation of the blood, which we must designate as very favorable, are all lost, as some claim, as soon as we pass from the simple position of support to the different exercises on the parallel bars.

It of course depends upon the manner in which the gymnast proceeds from an exercise of the one kind to an exercise of the other. But we know that the system of gymnastics prescribes the most exact directions in reference to the requirement of each one of these exercises and with regard to the care to be exercised in their execution. We must, of course, suppose that these directions are observed, since carelessness and abuse are always of incalculable danger to all actions of the body.

Let us look more closely at the principal evils which are said to endanger the health of the gymnast, even when the exercises on the parallel bars are conducted with proper care. Concerning the fear of spraining, of fracturing bones, and of tearing muscles, etc., we will say nothing, since the opponents of the parallel bars have themselves shown this to be unnecessary in the vain effort to prove that they were caused by the exercises on the parallel bars alone. The charge that these exercises tend to produce dislocation of the joint of the upper arm at the shoulder is founded on an erroneous conception of the construction and function of the joint.

The size of the small flat surface of the shoulder blade restrains the round head of the bone of the upper arm so little that the arm can be moved and turned in all directions, as occasion requires. Even with this construction the upper arm could not be moved so freely if nature had surrounded it with restraining bands or a narrow articular capsule. But the former are not provided and the capsule of the joint is so large that all movements can be made without any straining. On the

other hand, this capsule, although strengthened by sinewy masses and tendons, is too weak to fasten the bone of the upper arm securely to the shoulder-blade and to hold it firmly in its free position. There are around the entire joint strong groups of muscles that protect the joint and press the head of the bones of the upper arm against the shoulder-blade during all movements. The power and significance of this pressure does not only manifest itself during the simple hanging position (when a dislocation is impossible) but still more in the other exercises on the parallel bars, because the muscles are at a greater tension. But on account of its pliancy, it is not to be conceived that the articular capsule should be pressed disproportionately by the head of the upper arm. How little the articulate capsule is able to prevent a dislocation, and how much more the muscles are intended for that purpose we see, when only the cutting of the delta muscles or the paralysis of the same, causes the arm to sink by its own weight out of the articular cavity, and produces a "*luxato spontanea.*" From the construction of the joint of the shoulder, we see that a dislocation can only take place when the head of the bone of the upper arm slips below the under edge of the shoulder-blade and the arm is put in abduction at the same time. But the arms are never placed in this position in any of the exercises on the parallel bars. Hence it is not true that these exercises are especially conducive to the danger of dislocations of the joints of the shoulders, nor do they even tend to produce the same.

It is true that continued and excessive exercising will be followed by an unnatural enlargement (hypertrophy) of the muscles of the shoulders and arms, an evil connected also with many exercises on other apparatuses. On the other hand, if we look at the dancers with their thick legs and narrow shoulders, we must come to the conclusion that exclusive exercising of single groups of muscles should not be practised without a proper change, even in a gymnasium. But we cannot possibly condemn exercises simply on account of the consequences of improper execution and execessive practice.

The objection that these exercises are fraught with danger to the organs of the chest, would be much more serious if such in reality could be proven to exist, or even the secondary effects could be substantiated. We have shown that the support in itself expands the chest, enlarges the capacity of the lungs, and promotes the circulation of the blood.

These favorable conditions could only be altered by complicated exercises, in which at any stage the chest should be constrained in a fixed position, and at the same time the pupil should be compelled to hold his breath. This is, as is well known, never the case. When it is the purpose to bring the trunk in motion from the arms by the aid of all serviceable muscles, there can be no fixing of the chest in any certain position. To hold the breath is not only not necessary, but a great mistake, and if it should occur it would be noticed at once by a failure to do the exercise, and the pupil should be reprimanded for it by the teacher. The proper manner of breathing is here, as in singing, of great value, and can be used advantageously as an effective means to strengthen the lungs and organs of circulation. The gymnast must, in

the early stages of gymnastics, learn to use his respiratory organs in a proper manner, because he may otherwise injure himself even in many "free exercises," such as running, leaping, vaulting, etc. When he has advanced to the higher gymnastics, he will soon find that he can only do the exercises with a full, strong inhalation of the breath. The sound lungs have therefore the best protection against internal injury, while the weaker organs of respiration, under the proper direction, are stimulated to healthy action.

The few cases of hemorrhage of the lungs, congestion, etc, mentioned by some, with the chronic diseases of the organs of respiration resulting therefrom, can only occur where there is a morbid tendency, or where grave errors have been committed while exercising. As for the description of the cases of "tearing of the valves of the heart," found in some of the polemic treatises, we must say that these are not within the sphere of scientific etiology, but are more like a terrific phantom of an excited imagination, as the author himself acknowledges that he personally has never observed such a horrible occurence. As we likewise have no personal knowledge of any such accidents, and cannot discover in the exercises on the parallel bars the conditions favorable to the tearing of the valves of the heart, and find that the above named affections of the lungs cannot be caused by these exercises, we can therefore not concur in the assertion that these exercises are harmful in this respect.

Summing up the results of our investigation we find:

1. The exercises on the properly constructed parallel bars, given in the above described order and manner, are in themselves entirely without danger to the health of the gymnast.

2. Bodily skill and dexterity of great practical value are attained by these exercises, such as could not well be acquired by the use of any other apparatus.

3. They are in themselves adapted to producing a good effect on the health of the gymnast by strengthening the muscular and nervous systems, by expanding the chest, by quickening the respiration and the circulation of the blood.

Hence, we give it as our opinion, that the exercises, from a medical point of view, are not to be condemned, but that they are fully justified.

The Royal Scientific Deputation of the Medical Department.

Lehnert,	Housselle,
Casper,	Martin,
Juengken,	Frerichs,
Horn,	Virchow.

Berlin, Dec. 31, 1862.